**ABSTRACT**

**Introduction:** Probiotics are live microorganisms which when administered in adequate amounts and confer a health benefit to the host. Dairy foods like cheese, card, milk and ice-cream are considered useful vehicles for probiotic bacteria.

**Aim:** To compare the levels of salivary mutans streptococci before and after consumption of probiotic ice-cram.

**Materials and Methods:** 20 school children who were caries free, in the age group of 10–12 years, were selected and divided into group I and II which were given 60 ml probiotic ice-cream and normal ice-cream for 7 days, respectively. Assessment of saliva samples was done at baseline, 1 hr after consumption, and on the 7th day. Mitis Salivarius Bacitracin Agar was used for analysis. The number of colonies were counted and subjected to statistical analysis.

**Results:** The study showed mark reduction in salivary mutans streptococci counts in saliva after 1 hr and on the 7th day in the probiotic group.

**Conclusion:** Pathogenic microorganisms could be displaced by probiotic bacteria. Thus, use of probiotic products could be exploited for the prevention of enamel demineralization.

---

**Introduction**

Dental caries is one of the most prevalent diseases in humans, second only to the common cold. The economic burden for the treatment of this dental infection is staggering. Although a disease of multifactorial origin, it is considered a result of the interplay of three principal factors: host, microflora and diet. A group of phenotypically similar but genetically different streptococcal species, known as mutans streptococci, are considered the main etiological agents for dental caries in humans. Based on DNA homology, mutans streptococci are divided into seven species: *Streptococcus mutans, S. sobrinus, S. ratti, S. riceti, S. downei, S. ferus, and S. maccaceae*; which can be subdivided into eight serotypes: a, b, c, d, e, f, g and h. Of these species, *S. mutans* and *S. sobrinus* have been implicated as the primary causative agents of dental caries in humans.

Disease could be prevented not only by targeting the pathogen directly (e.g. with antimicrobial or antiadhesion agents) but also indirectly by interfering with the ecological pressure responsible for the selection of the pathogen. Various methods were tried to suppress the caries activity. One of the novel strategies for prevention of dental caries is by manipulation of resident oral microorganism by ingestion of probiotic organisms.

The interest in probiotic therapy to prevent oral diseases has grown remarkably over the years. PROBIOTIC, meaning ‘For Life’ was first coined in the 1960s, by Lilly & Stillwell. Food and Agriculture Organization/World Health Organization ((FAO/WHO) in 2001 defined it as “Live microorganisms which when administered in adequate amounts confer a health benefit on the host”. *Lactobacilli* and *Bifidobacterium* are the most commonly used and studied probiotic organisms. Replacement of cariogenic bacteria by non-pathogenic bacteria improved oral health in children, which can be done with the use of probiotics.

Dairy foods like cheese, yoghurt and milk are considered useful vehicles for probiotic bacteria, but an ideal administration vehicle has yet to be identified. Ideally, it has been suggested that exposure early in life may facilitate a permanent installation of health promotion. Hence the probiotic vehicle should be suitable for all ages and especially for young children. In this context, ice-cream is an interesting probiotic food, as it is popular and universally liked.

This study was carried out to compare the effect of consumption of probiotic containing ice-cream and normal ice-cream on levels of salivary mutans streptococci.

**Materials and method**

Ethical clearance was obtained prior to the start of the study from the ethical committee. Informed consent from the parent/guardian was obtained. 20 school children with caries free teeth between ages 10-12 years selected for study.

Twenty children were randomly selected from the Gandhinagar
municipality school number-2 for the study. The children were equally divided by randomization into group I (probiotic ice-cream group) and group II (plain ice-cream group) comprising 10 children in each group, who were given 42 g (60 ml) probiotic ice-cream and plain ice-cream respectively for 7 days. Ice-cream was given once daily. The subjects were encouraged to maintain their normal oral hygiene habits. No tooth brushing was allowed for at least 1 h after eating the ice-cream.

Inclusion criteria
- Age group of the children 10–12 years
- No clinically detectable caries
- No history of any preventive dental treatment

Exclusion criteria
- Severely ill children
- Medically compromised children
- Children who had been on medication in the last 6 months
- Children undergoing orthodontic treatment

Collection of saliva was done after the clinical examination. Children were made comfortable and asked to swallow pre-existing saliva in order to clear the mouth of any residual saliva. Sterile hard plastic container was given to each student and the student was asked to split the saliva into it. The samples collected were handed over to the Biocare research laboratory for analysis on the same day. In the laboratory samples were stored at room temperature (17°C–25°C) prior to the analysis. Assessment of saliva was done at baseline, 1 hr and on the 7th day by using Mitis Salivarius Bacitracin Agar. The plates were incubated at 37°C anaerobically. Colony characteristics were studied after 72 h. Mutans Streptococci in saliva was determined by using a colony counter and the number of colony forming units was counted and result were analysed statistically.

Result
Excel and SPSS software packages were used for statistical analysis. The results were averaged (mean + standard deviation) for each parameter and parametric tests were used for statistical analysis.

In this study, mean salivary mutans streptococci count at baseline for probiotic ice-cream and plain ice-cream groups was 16048.80 and 16804.10 respectively. When comparison of the mean salivary mutans streptococci count after consumption of probiotic ice-cream and plain ice-cream was 9177.00 and 21043.70 respectively. When compared after 7 days, mean salivary mutans streptococci count at baseline, at 1 hr and on 7th day by using Mitis Salivarius Bacitracin Agar. The administration of probiotics to small children may be difficult in the daily routines. Hence, different dairy products could serve as a vehicle for probiotics. Anti-cariogenic property is due to the presence of casein, calcium and phosphorus in the ice cream which adds the benefit to probiotic containing ice-cream and it is a dairy product that can be stored for a long time without any significant decrease in the number of viable probiotic cells.21

The effects of probiotics on the microbiota can be due to the competition for binding sites or secretion of antimicrobial components and lactic acid bacteria can produce different antimicrobial components. Adhesion of probiotics in biofilms and positive effects of Bifidobacterium lactis Bb-12 within the human body, including immune response and gastrointestinal health in the young children.15

The administration of probiotics to small children may be difficult in the daily routines. Hence, different dairy products could serve as a vehicle for probiotics. Anti-cariogenic property is due to the presence of casein, calcium and phosphorus in the ice cream which adds the benefit to probiotic containing ice-cream and it is a dairy product that can be stored for a long time without any significant decrease in the number of viable probiotic cells.21
Ice-cream is a delicious, wholesome, nutritious frozen dairy product, which is widely consumed in different parts of the world by all age groups and especially children. Even though ice-cream has sweetening and flavouring agents, ice-cream has nutritional significance and could be an interesting carrier of probiotic food, with reported advantages.2 Dairy products like milk and yogurt may not be liked by all the children and there are chances that children may not agree to continue with the study but ice-cream is universally accepted by children compared any other dairy products. Hence, ice-cream was used as a vehicle in this study based on above mentioned reasons and it was well accepted by the participants.

On comparing the mean salivary mutants streptococci at baseline, after 1 h, and after 7 days of consumption of probiotic and normal ice-cream, the results were found to be statistically significant after 7 days.

Significant reduction in salivary mutants streptococci (P ≤ 0.05) was found in our study after consumption of probiotic ice-cream, which was in accordance to the previous studies done by Chinnappa et al.28, Caglar et al.,29 Cildir SK et al.30 and Zhu et al.31 Singh et al.32 also reported that probiotic ice-cream brought about a statistically significant reduction in mutants streptococci count. Similarly, Jindal et al.33 concluded that statistically significant reduction in salivary mutants streptococci counts was recorded after probiotic ingestion. Whereas our results were in contrast to the previous study done by Chuang et al.34 in which no differences in the counts of mutants streptococci between probiotic and control groups were found.

Comelli et al. examined 23 microorganisms used in the dairy industry for potential probiotic properties with respect to the prevention of dental caries. They showed that two S. thermophilus species and two L. lactis species were able to adhere to hydroxyapatite. The authors concluded that such a property in a non-pathogenic dairy bacterial strain might prove beneficial in modulating the establishment of cariogenic dental plaque.6

During the period of test product consumption, continuously the mean value of mutants streptococci counts dropped, despite the sugar content of the ice cream. A caries-preventing effect of the lactic acid bacteria (LAB) and some streptococci species has been demonstrated. LAB were present on the teeth surfaces, but the exact role of LAB in dental caries prevention is not yet clear. Some studies have shown that LAB can inhibit the growth of cariogenic bacteria and reduce the acid production in the mouth. LAB are also known to produce anti-cariogenic substances, such as bacteriocins and hydrogen peroxide, which can inhibit the growth of cariogenic bacteria. The probiotic bacteria can also stimulate the immune system of the host, which can help in the prevention of dental caries.

In this study unstimulated saliva was collected from each participant, as the analysis of unstimulated saliva is more sensitive than stimulated saliva. In this study unstimulated saliva was collected from each participant, as the analysis of unstimulated saliva is more sensitive than stimulated saliva.

In conclusion, the consumption of probiotic ice-cream may have a caries-preventing effect on cariogenic bacterial flora. Clinical oral investigations, 15(4), 471-472.

Correspondence:
Ashok S. Patil, M.S., M.S., Ph.D., Professor and Head, Department of Oral Medicine and Radiology, Dr. N. V. Patil Dental College and Hospital, Nagpur, India.

References:
4. Zhu, Y., Xiao, L., Shen, D., & Hao, Y. (2010). Competition between yogurt probiotics and Mutans streptococci counts was recorded after probiotic ingestion. Whereas our results were in contrast to the previous study done by Chuang et al. in which no differences in the counts of mutants streptococci between probiotic and control groups were found. Significant reduction in salivary mutants streptococci (P ≤ 0.05) was found in our study after consumption of probiotic ice-cream, which is probably because of the high sugar content and absence of lactobacilli in young adults. Acta Odontologica Scandinavica, 63(6), 317-320.